distal coronary sinus (DCS), proximal coronary sinus (CSos), left pulmonary artery (LPA), and right ventricular apex (RV). 7 single and 7 dual current pathways were compared. Single capacitor biphasic waveforms (3 ms/1 ms in duration) were delivered through each current pathway after atrial fibrillation induction with rapid atrial pacing. Probability of success curves were then determined by giving 10 shocks for each waveform starting at threshold. The mean and standard deviation of the total delivered energy for the 50% success points (E50) for each electrode configuration are shown (Fig.). Dual current pathway "H" (0.35 ± 0.16 joules) had a lower E50 than all other single (A-G) and dual current (I-N) pathway configurations tested. Compared to the single current pathway ("A") being employed with the first implantable atrial defibrillators, atrial defibrillation thresholds can be markedly reduced by using dual current pathways. With more efficient electrode configurations, the discomfort of internal atrial defibrillation shocks might be further minimized.

11:45

745-6 Metoprolol is More Effective than d,l Sotalol for Prevention of Recurrence of Ventricular Tachyarrhythmias after Implantation of a Cardioverter/Defibrillator

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About 20–50% of patients (pts) with an implantable cardioverter/defibrillator (ICD) are additional treated with antiarrhythmic drugs to prevent frequent ICD discharges. The purpose of this prospective randomized study was to evaluate the efficacy of d,l sotalol (Sot) and metoprolol (Met) regarding the recurrence of arrhythmic events and death after implantation of a cardioverter/defibrillator. After ICD implantation 70 pts were randomly assigned to either Met (104 ± 37 mg/day in 35 pts) or Sot (242 ± 109 mg/day in 35 pts). Both groups were comparable for sex, age, ejection fraction, extent of structural heart disease and presenting arrhythmia.

Results: Met treatment led to a marked reduction in the recurrence of ventricular tachycardia (VT) or fibrillation (VF) as compared to Sot during a follow-up of 26 ± 16 months. Whereas 80% of the pts in the Met group were free of VT recurrence only 51% of the pts treated with Sot were free of VT recurrence (p = 0.02). Actuarial rate for freedom of fast VT or VF were 80% in the Met group compared with 46% in the Sot group (p = 0.0016). During follow-up there were 3 death in the Met treated pts compared to 6 death in the Sot arm. Actuarial rates for overall survival were not different (91% vs 83%, p = 0.29).

Conclusions: In this randomized study the recurrence rate of life threatening ventricular tachyarrhythmias after ICD implantation is lower in pts treated with Met than in pts treated with Sot.

746 Nuclear Cardiology: Acute Myocardial Infarction

Tuesday, March 18, 1997, 10:30 a.m.–Noon
Anaheim Convention Center, Room A19

10:30

746-1 Normal Rest Tetrofosmin SPECT Imaging in Patients with Chest Pain and Normal or Nondiagnostic ECG in the Emergency Department is Associated with Lower Need for Subsequent Cardiac Catheterization and Revascularization

F.J.Th. Wackers, G.V. Heller, S. Stowers, R.C. Hendel, S. Herman, J. Baron, E. Daher, for the Acute Chest Pain Tetrofosmin Trial. *Yale Univ., New Haven, CT, USA*

We have demonstrated in a multicenter trial that rest Tc-99m Tetrofosmin (Tetro) SPECT myocardial perfusion imaging in the emergency department (ED) in patients (pts) with chest pain and normal or nondiagnostic ECG has a high negative predictive value (98%) for the detection of acute infarction (MI). In order to determine the prognostic value of ED Tetro SPECT and the clinical relevance of "missing" MI's, 357 pts with chest pain and normal or nondiagnostic ECG, who had rest Tetro SPECT in ED had follow-up (FU) in-hospital (IH) and for 30 days (30 d). ED SPECT imaging was normal in 295 pts (83%) and abnormal in 62 pts (17%). All pts were admitted to rule out MI. Managing physicians were blinded to SPECT imaging results. Primary endpoints were ischemic death and recurrent MI, a secondary endpoint was revascularization (Revasc). FU was 100% complete IH, and 91% complete for being alive at 30 d.

Events	IH (# pts)	30 d (# pts)	Total (# pts)
Death	0	0	0
MI	20	0	20
Cath	88	8	96
Revasc	34	2	36

At 30 d follow-up, pts with abnormal ED Tetro SPECT had significantly more acute MI (21% vs. 2%, p < 0.001), more cardiac catheterization (43% vs. 23%, p = 0.002), and more Revasc (23% vs. 7%, p < 0.001) than pts with normal rest ED Tetro SPECT. Thus, abnormal rest ED Tetro SPECT in pts with chest pain and normal or nondiagnostic ECG identifies a subgroup of patients with higher cardiac catheterization rate and higher clinical need for Revasc during subsequent 30 d follow-up. Conversely, pts with normal ED SPECT are at relatively low risk for Revasc.

10:45

746-2 Early Scintigraphic Detection of Acute Myocardial Infarcts in Humans. A Technetium-99m-Glucaric Acid (^{99m}Tc-GA) Study

C. Brunelli, P. Spallarossa, P. Rossettin, G. Villa, C. Motta, G.P. Bezante, G. Calcagno, L. Corsiglia, G. Mariani, S. Caponnetto. *Department of Internal Medicine, University of Genoa, Italy*

Background: Experimental studies demonstrated that ^{99m}Tc-GA may be used to detect acute myocardial infarction (AMI) in canine models with temporary artery occlusion. In these studies, ^{99m}Tc-GA showed increased affinity for necrotic myocardial tissue (infarct-avid imaging) without marked liver and osseous structure uptake.

Aim of the study: To examine the utility of ^{99m}Tc-GA as a myocardial imaging agent in patients (pts) with severe myocardial ischemia Methods: Seventeen pts (mean age 59 ± 11 years) with prolonged chest pain (>60 min) and ST segment elevation (>0.2 mV in two adjacent leads) were considered for the study. ^{99m}Tc-GA was administered as a single bolus iv injection (900–1000 Mbq) within 2–41 hours (mean 10, median 7) from onset of symptoms. Planar images were acquired 3 hours after administration in three standard projections (Ant, LAO, LL), about 2 million counts in the field of view. Results: ^{99m}Tc-GA uptake was clearly identified in 10 pts (Scan+). All Scan+ pts were injected within 9 hours (mean 5.1) from symptoms. A diagnosis of AMI was enzymatically confirmed (CK peak value twice or more the upper limit of the normal range [190 U/l]) in all but one Scan+ pts. This pt reached a CK peak value of 350 U/l which can be considered borderline. Seven pts showed a negative uptake (Scan–). Five of them had a confirmed AMI but were late injected (within 13–41 hours from symptoms). In the remaining two Scan– pts who were injected 6 and 9 hours from symptoms, the diagnosis of AMI was not confirmed by serum enzymes. Five pts who were acutely Scan+ underwent one month later a second scintigraphic study that did not show area of ^{99m}Tc-GA uptake. Conclusions: These data confirm the potential of ^{99m}Tc-GA as a direct scintigraphic indicator of acute myocardial necrosis. ^{99m}Tc-GA could be important when ruling out AMI in pts with unstable angina.

11:00

746-3 Technetium-99m Sestamibi Infarct Size Predicts Mortality

T.D. Miller, D.O. Hodge, J.M. Sutton, C.L. Grines, J.H. O'Keefe, M.A. DeWood, R.D. Okada, W.O. Fletcher, R.J. Gibbons. *Mayo Clinic, Rochester, MN, USA*

A previous Mayo Clinic study demonstrated that quantitative tomographic Technetium (Tc)-99m sestamibi infarct size measured at hospital discharge predicts subsequent mortality. The purpose of the present study was to provide independent confirmation of this finding in a separate, multicenter population. Two hundred eight patients (153 M, 55 F, age 62 ± 11 years) from 23 different medical centers (no Mayo patients), all of whom were treated acutely with thrombolysis or PTCA, were followed for a minimum duration of 6 months after myocardial infarction. Tomographic Tc-99m sestamibi scans performed at hospital discharge in each center were processed and quantitated using previously published methods at a core laboratory. Median infarct size was 14% of the left ventricle (25th percentile 3%, 75th percentile 27%). Seventeen patients died during follow-up. Infarct size was significantly associated with subsequent mortality (χ^2 = 7.39, p = 0.007). Mortality rates were:

Group	3 Month	6 Month	12 month
Entire study group	4%	5%	6%
Infarct size <14%	1%	2%	2%
Infarct size ≥14%	8%	8%	9%

Conclusion: In this multicenter study, patients treated acutely with reperfusion therapy had a low post-discharge mortality rate. Despite this low mortality, this study provides independent confirmation of the previous single-center results – infarct size measured by quantitative Tc-99m sestamibi imaging at hospital discharge predicts subsequent mortality.

11:30

746-5 Quantitative Assessment of the Effects of Acute Ischemia on Myocardium in Unstable Coronary Artery Disease by Fatty Acid Metabolic Imaging

S. Nishimura, Y. Ohta, K. Katoh, T. Tamaki, K. Yumoto, Y. Yamauchi, K. Odaka, A. Yoshino. *Yokohama Rosai Hospital, Yokohama, Japan*

Early assessment of post-ischemic and jeopardized myocardium in patients with unstable coronary artery disease, i.e. unstable angina (UA) and non-Q-wave MI (NQMI) is necessary to optimize the treatment. To examine whether I-123 beta-methyl iodophenyl pentadecanoic acid (BMIPP) can quantify the effects of acute ischemia on myocardium in patients with UA and NQMI, we compared quantitative BMIPP with serum troponin T (TnT) and creatine kinase MB (CK-MB) levels in 39 patients (mean 65 years, male/female = 30/9) with no previous MI. All pts admitted to CCU within 12 hr. after the onset of symptom. Blood samples were drawn at every 12 hr. for TnT and every 6 hr. for CK-MB during first 2 days. After stabilization of symptom by medical therapy, BMIPP and T1 were separately performed mean 4.4 days after onset. Polar map images of BMIPP and T1 were quantitatively compared to normal data. All patients had significant coronary artery disease (n = 34) or induced vasospasm (n = 5) documented by angiography performed within 6 days after onset. Twenty-four patients had elevated TnT levels (range 0.11–4.94 ng/ml). In 6 of other 15 patients, TnT was negative (<0.1 ng/ml) but persistent T wave inversion was observed. The sensitivity for detection of culprit- and vasospasm-induced lesion territories by BMIPP and T1 were 88% and 54%, respectively, $p < 0.003$). There was a significant correlation between peak TnT and MB levels and percent defect size by BMIPP ($r = 0.59$, $p = 0.004$ and $r = 0.52$, $p = 0.004$, respectively) but no correlation by rest T1 ($r = 0.18$, p = ns and $r = 0.20$, p = ns, respectively). In conclusion, rest BMIPP imaging has potential to locate the culprit-lesion or vasospasm-induced vessel territories and quantify the extent of post-ischemic or jeopardized myocardium in patients with UA or NQMI even after stabilization of symptom.

11:45

746-6 Is there Justification for Follow-Up Symptom Limited Exercise Myocardial Perfusion Studies Late Post Myocardial Infarction?

B.J. Deonarine, F.M. Prigent, R.B. Jacaruso, K. Morrison, R.M. Steingart. *Winthrop-University Hospital, Mineola, NY, USA, SUNY at Stonybrook, Stonybrook, NY, USA*

It is common clinical practice to perform a pre-discharge low level (LL) myocardial perfusion study followed by a symptom-limited (SL) study, 4–8 weeks later, to risk stratify patients (pts) after myocardial infarction. The clinical utility of this practice was retrospectively evaluated by comparing pairs of LL and SL SPECT studies in 36 stable post-MI pts. Their age was 60 ± 10 years (mean ± SD) with 75% men. Time between studies was 54 ± 28 days (range 11–143) with no interval cardiac events or interventions. Thallium was used in 32 pairs and sestamibi in 4. SPECT studies were interpreted by two blinded observers using a 20 segment scoring system. *Results:*

	LL	SL	$p <$
% mphr achieved	64 ± 12	82 ± 13	0.001
Mets achieved	5.1 ± 1	8.5 ± 3	0.001
Total abnormal segments	185	194	NS
Mean abnormal segments/pt.	5.1 ± 2.9	5.4 ± 3.4	NS
# fixed defects	116 (63%)	82 (42%)	0.004
# reversible defects	64 (35%)	106 (55%)	0.002
# reverse redistribution	5 (2%)	6 (3%)	NS

There were no differences in β-blocker use (86% Vs 75%), clinical or EKG response to exercise, or presence of transient ischemic dilatation. There were 106 reversible defects on SL: 48% were present and reversible on LL, 26% were present but fixed on LL and 26% were new. The 28 fixed defects on LL that became reversible on SL were mostly of moderate intensity (71%), whereas the 79 defects which were fixed on both studies were mostly severe (66%; $p < 0.01$). Five perfusion patterns were observed: 1) normal or equivocal on both (4 pts); 2) mostly fixed defects on both (8 pts); 3 combined fixed and reversible defects on both with no interval change (9 pts); 4) combined fixed and reversible defects with less ischemia on SL (1 pt); and 5) combined fixed and reversible defects with more ischemia on SL (14 pts). Of those with pattern #5, 10 pts had 2 or more additional reversible segments on SL in the same coronary territory compared to LL; 4 other pts had at least two new reversible segments in a remote coronary territory, compared to LL. Thus 14/36 (39%) pts were identified with significantly more ischemia on SL than on LL. *Conclusion:* Late symptom-limited myocardial perfusion testing following low level pre-discharge testing was justified because it demonstrated new ischemia in remote coronary territories or territories initially showing predominantly fixed defects. These may indicate additional risk for future cardiac events.

747 Myocardial Ischemia: Can Gender Differences Be Identified?

Tuesday, March 18, 1997, 10:30 a.m.–Noon
Anaheim Convention Center, Room C2

10:30

747-1 Negative Survival Impact of Female Gender and Extensive Myocardial Hypoperfusion in Syndrome X: A Multicenter Study

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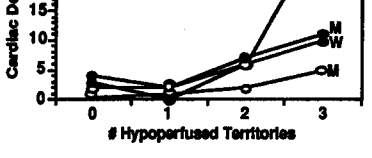
Chest pain with a normal angiogram (Syndrome X) is more common in women, and usually has an excellent prognosis (>92% 7-year survival in C.A.S.S.). To elucidate correlates of decreased survival in Syndrome X, we studied a multicenter registry of 2,613 stable chest pain pts (age 69 ± 11 yrs; 46% women, 3% diabetic, 2% hypertensive) referred for stress myocardial perfusion tomography (SPECT) and diagnostic coronary angiography. No coronary artery stenosis >50% occurred in 931 (66%) of men (M) and 998 (82%) of women (W). Overall, 3-year cardiac death rates were low (M = 2.7% vs. W 2.1%; p = NS). The figure illustrates cardiac death rates as a function of gender, the number of hypoperfused SPECT myocardial territories (0–3) and the presence (•) or absence (o) of coronary artery disease (CAD). Kaplan-Meier 3-year survival was 62% in the 33 women (3.3%) with no CAD plus 3 hypoperfused SPECT territories ($p < 0.001$ vs. men and women with CAD).



Conclusion: The subset of women with Syndrome X and extensive stress-induced hypoperfusion have significantly reduced survival, possibly due to the undertreatment of microvascular myocardial ischemia.

10:45

747-2 Echocardiographic Diastolic Function – A Sensitive Noninvasive Approach for the Detection of Coronary Artery Disease in Women

C.M. Schannwell, F.C. Schoebel, B. Pölitz, R. Marx, M. Leschke, B.E. Strauer. *Clinic of Cardiology, Heinrich Heine University Düsseldorf, Germany*

Background: Ergometric testing for noninvasive evaluation in suspected coronary artery disease (CAD) is regarded to be less sensitive in women than in men. As this represents a serious drawback in management of women with suspected CAD new diagnostic strategies are warranted.

Methods: To assess the relevance of left ventricular (LV) diastolic function in this setting 45 (24 male, 21 female) consecutive patients (pts) with suspected CAD and normal LV systolic function were investigated electrocardiographically during bicycle ergometry and echocardiographically at rest on the day prior to cardiac catheterization. Exercise was to be regarded as predictive of CAD in case of angina pectoris and ST-segment depression of >0.2 mV. Doppler echocardiographic parameters included: peak early diastolic flow velocity (V_E; m/s), peak late diastolic flow velocity (V_A; m/s), early-to-late flow velocity (V_E/V_A), acceleration (AT; ms) and deceleration